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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/732,953	12/11/2003	Mark Charles Hakey	ROC920030270US1	9243
30206	7590	10/02/2006	EXAMINER	
IBM CORPORATION ROCHESTER IP LAW DEPT. 917 3605 HIGHWAY 52 NORTH ROCHESTER, MN 55901-7829			ZARNEKE, DAVID A	
			ART UNIT	PAPER NUMBER
			2891	

DATE MAILED: 10/02/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/732,953

Applicant(s)

HAKEY ET AL.

Examiner

David A. Zarneke

Art Unit

2891

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 25 July 2006.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1,2,4-9,12-14 and 22 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1,2,4-9,12-14 and 22 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
 - ☐ Certified copies of the priority documents have been received in Application No. _____.
 - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)
Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Response to Arguments

Applicant's arguments filed 7/25/06 have been fully considered but they are not persuasive.

The first argument is that Wu and Chu teaches depositing oxide on a Si substrate, not a buried oxide substrate and, therefore, there is no motivation to combine these two references.

As noted before, it is pointed out that this argument fails to consider the rejection as a whole. The APA teaches all of the claims except for the selective deposition of the silicon dioxide in the STI trenches, which is taught by Wu. Therefore, the combination of the selective deposition used in Wu with the formation of the STI region over an exposed buried oxide would result in the silicon dioxide being nucleated on the buried oxide. The motivation is provided by Wu, which states that the use of an LPD oxide would result in a planar surface and lower budgets (1, 61+). These benefits motivate a skilled artisan to use the LPD oxide of Wu in the invention of the APA.

In response to applicant's arguments against the references individually, one cannot show nonobviousness by attacking references individually where the rejections are based on combinations of references. See *In re Keller*, 642 F.2d 413, 208 USPQ 871 (CCPA 1981); *In re Merck & Co.*, 800 F.2d 1091, 231 USPQ 375 (Fed. Cir. 1986).

The next argument is that the use of Applicant's specification to teach the nucleation of the surface "represents the epitome of hindsight analysis" because the "legal conclusion must be reached on the basis of the facts gleaned from the prior art."

Please note that the rejection's reliance upon the specification merely points out what is admitted to be inherent to LPD. The top of page 8 of the specification states that using LPD oxide deposition "occurs in such a manner that the oxide nucleates on, and grows from, the exposed surface of the BOX layer". Therefore, the process itself inherently nucleates the surface. Hindsight is not used because it is admitted that nucleation is inherent to the process.

The last argument is that the cleaning step is not disclosed because it is admitted that the chemicals used to perform the cleaning are conventional.

As further support for the contention that a cleaning step is conventional, US Patents 6,437,400 (3, 58+), 6,949,446 (5, 57+), 6,114,216 (43, 43+), 5,851,900 (3, 49+), and US Patent Application Publication 2004/0038495 (3, [0036]) all cite the cleaning of a STI trench to remove native oxides and other contaminants.

Therefore, the previous rejection stands as written and in light of the above discussion.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the

invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

Claims 1, 2, 4-9, 13, 14, and 22 are rejected under 35 U.S.C. 103(a) as being unpatentable over Applicant's admitted prior art Figure 1 in view of Wu, US Patent 5,994,178.

Applicant's admitted prior art (APA) Figure 1 teaches a method of forming shallow trench isolation (STI) regions in a silicon-on-insulator layer on a buried oxide layer, the method comprising:

forming a shallow trench isolation region in the silicon-on-insulator layer [106] with the sidewalls extending to the buried oxide layer [104] to define first and second active regions separated by the shallow trench isolation region; and depositing silicon dioxide [112] in the shallow trench isolation region on the buried oxide layer.

APA fails to teach selectively depositing the silicon dioxide in the STI region without depositing the silicon dioxide on the first and second active regions by nucleating the deposition of the silicon dioxide on the buried oxide layer.

Wu teaches selectively filling STI trenches with an LPD oxide (3, 8+).

it would have been obvious to one of ordinary skill in the art at the time of the invention to use the LPD oxide of Wu in the invention of APA because Wu teaches the use of an LPD oxide to fill the STI trench produces a planar surface and lower budgets (1, 61+). Applicant's own specification states on the top of page 8; "This deposition occurs in such a manner that the oxide nucleates on, and grows from, the exposed surface of the BOX layer 204." This means that the LPD of oxide inherently nucleates and grows on the on the buried oxide.

Regarding claim 2, Wu the silicon dioxide is deposited by liquid phase deposition (3, 8+).

As to claim 4, APA teaches forming a pad oxide layer [108] on the silicon-on-insulator layer.

In re claim 5, while APA fails to teach the pad oxide layer has a thickness of between approximately 2 nm and approximately 10 nm, it would have been obvious to

one ordinary skill in the art at the time of the invention to optimize the pad oxide layer thickness (MPEP 2144.05).

Regarding claim 6, APA teaches forming a pad nitride layer [110] on the SOI layer.

With respect to claim 7, while APA fails to teach the pad nitride layer has a thickness of between approximately 10 nm and approximately 150 nm, it would have been obvious to one ordinary skill in the art at the time of the invention to optimize the pad oxide layer thickness (MPEP 2144.05).

As to claim 8, while APA fails to teach cleaning the shallow trench isolation region before selectively depositing silicon dioxide, the cleaning of the cleaning the shallow trench isolation region before selectively depositing silicon dioxide is a conventional step known to a skilled artisan. The cleaning of a trench prior to deposition of a material therein is commonly known in the art to a skilled artisan. The removal of etching residue, native oxides, and other contaminants is common and generally required in this art. This is further alluded to in the specification (page 7, lines 24+) of this application. The disclosure of the use of conventional chemicals to clean a trench obviates the cleaning step itself.

In re claim 9, while APA fails to teach cleaning the shallow trench isolation region reduces an amount of native oxide present along each exposed wall of the shallow trench isolation region, this is a conventional step known to a skilled artisan. The use of conventional materials to perform there known functions in a conventional process is obvious (MPEP 2144.07).

In re claim 13, Wu teaches processing the selectively deposited silicon dioxide to provide a density substantially similar to a density of thermally grown silicon dioxide (3, 20+).

Regarding claim 14, Wu teaches processing the selectively deposited silicon dioxide further includes annealing the selectively deposited silicon dioxide at a temperature between approximately 800°C and approximately 1500 °C (3, 20+).

With respect to claim 22, APA teaches forming a pad oxide layer [108] between the pad nitride layer [110] and the silicon-on-insulator layer [106].

Claims 12 is rejected under 35 U.S.C. 103(a) as being unpatentable over Applicant's admitted prior art Figure 1 in view of Wu, US Patent 5,994,178, and Chu et al., US Patent 5,851,900.

While APA fails to teach overfilling the shallow trench isolation region with an excess amount of silicon dioxide during selective deposition; and planarizing the shallow trench isolation region by removing the excess amount, the overfilling and planarizing of the LPD oxide is commonly known in the art, as taught by Chu et al., US Patent 5,851,900 (Figures 7 and 8 & 4, 20-30 & 4, 60+). A skilled artisan knows that a planar surface is highly desired. The use of conventional materials to perform their known functions in a conventional process is obvious (MPEP 2144.07).


Conclusion

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. The art cited but not relied upon all teach the use of LPD oxide to fill an STI trench.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to David A. Zarneke whose telephone number is (571)-272-1937. The examiner can normally be reached on M-Th 7:30 AM-6 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, William Baumeister can be reached on (571)-272-1722. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).


David A. Zarneke
Primary Examiner
September 22, 2006